

# Influence of pesticide use on gross domestic product in Santa Maria de Jetibá-ES

Nícolas Woelffel<sup>1</sup>, Gilson Silva-Filho<sup>2</sup>, Rosane Hein de Campos<sup>3</sup>, Hélio Gustavo Santos<sup>4</sup>

<sup>1</sup>Postgraduate program in engineering and sustainable development, UFES, Vitória, Espírito Santo, Brazil

Email: nicolas.woelffel@gmail.com

<sup>2</sup>Postgraduate program in engineering and sustainable development, UFES, Vitória, Espírito Santo, Brazil / University Center São Camilo, Cachoeiro de Itapemirim, ES, Brazil.

Email: silva.filho.gilson@gmail.com

<sup>3</sup>Postgraduate program in engineering and sustainable development, UFES, Vitória, Espírito Santo, Brazil

Email: rosanehein@gmail.com

<sup>4</sup>University Center São Camilo, Cachoeiro de Itapemirim, Espírito Santo, Brazil

Email: heliogustavo3@hotmail.com

**Abstract**— The increased use of pesticides due to the expansion of agricultural production and the lack of more comprehensive and rigorous legislation and enforcement has made Brazil a major consumer of pesticides, assuming in 2009 the position of largest consumer market of pesticides in the world. The state of Espírito Santo has a relevant influence on this prominence of the country, placing itself among the ten Brazilian states that have the largest sales in the country of this class of pesticides, being Santa Maria de Jetibá an important trader and consumer of pesticides due to its intense agricultural production. Given this intense commercialization of pesticides, and the problems caused by pesticides to environmental and human health, the objective was to make a situational diagnosis of the commercialization and use of pesticides in the municipality of Santa Maria de Jetibá-ES. For this, data from existing public studies and interviews with farmers from the municipality of Santa Maria de Jetibá were used, analyzing the influence on the Gross Domestic Product of the municipality. In the city of Santa Maria de Jetibá, there was intense agricultural production and intense use of pesticides, and the percentage share of GDP was much higher than those of neighboring cities that do not practice intensive agriculture.

**Keywords**— Commercialization of pesticides, Health impact, Pesticide, Pesticide Consumption.

## I. INTRODUCTION

The expansion of agricultural production and the lack of more comprehensive and rigorous legislation and enforcement make Brazil stand out as a major consumer of pesticides and has, since 2009, assumed the position of the largest pesticide consumer in the world (PACHECO, 2009; IBGE, 2019).

According to Nascimento Neo et al. (2014) to increase productivity, maintain the production cycle and generate employment, the use of pesticides is an appropriate resource, given its basic control function such as crop pests. The use of pesticides was leveraged by agribusiness in order to boost consumer market purchases. In large part of agricultural practices, as the ones aimed at accomplishing their own economic benefits (KANCANS et al., 2014).

The World Health Organization defines pesticides as any "substance capable of controlling a pest that may pose a risk to populations or the environment". In this sense, pesticides are used to control bacteria, fungi, weeds, arthropods, mollusks, rodents and any life forms harmful to the environment or human health and well-being (WHO, 2005).

The term pesticide began to be adopted in Brazil from Federal Law No. 7802/1989, regulated by Decree No. 4074/2002 of products and agents of physical, chemical or biological processes, intended for use in production sectors, storage and processing of agricultural products, pastures, protection of native or planted forests, other ecosystems and urban, water and industrial environments whose purpose is to alter the composition of flora or fauna in order to preserve them from the action of living beings considered harmful, as well as the substances and

products used as defoliants, desiccants, stimulators and growth inhibitors (BRAZIL, 1989).

The mass use of pesticides in agriculture occurred in the 1950s in the United States, with the so-called 'Green Revolution', which was intended to modernize agriculture and increase its productivity. In Brazil, the Green Revolution took place in the 1960s and, with the implementation of the National Program for Agricultural Pesticides (PNDA), had a significant increase in the 1970s. PNDA linked the use of these substances to the granting of agricultural credits, being the States are the main driver of this practice (SIQUEIRA, 2013; SOUZA, 2011; JOBIM, 2010).

After World War II, the use of pesticides increased significantly due to the development of chemical synthesis industries. Today's agriculture is based on the Green Revolution created in the 1960s, structured in monoculture production using pesticides and other products and techniques that enhance productivity (CLEAVER JR, 1972; KOLAR et al., 2008).

Brazil has public policies that promote the use and trade of pesticides. Policies maintained by the influence of the ruralist bench in the National Congress. Examples are the costs of registering products with the National Health Surveillance Agency – Anvisa (from R\$ 180.00 to R\$ 1.800.00) and the exemption, in most states, of the Tax on the Commercialization of Goods and Services (ICMS) (SOARES et al., 2012).

Worldwide spending on pesticides has grown annually. According to Meyer (2003) and the World Health Organization (WHO, 2010), developing countries consume 20% of all pesticides produced in the world. The use of pesticides has continued to increase, where the turnover of pesticides worldwide accounted for about 28% of businesses (CAVALCANTE, 2014).

According to Embrapa (2014), the annual consumption of pesticides in the world is approximately 2.5 million tons.

In Brazil, the annual consumption was over 300 thousand tons of the marketed crude product, being approximately 130 thousand tons of active ingredient (ia), which represents the equivalent of a 700% growth in the use of pesticides, in parallel with the growth of 78% in agriculture by 2013 (EMBRAPA, 2013).

Brazil is the world's largest consumer of pesticides. This is due to the tax incentives derived from public policies to the pesticide product, applying the policy that allows tax benefits to the use, marketing, production and

importation of pesticides (MELO, 2016) as public policies to encourage agricultural poisons that occur through extrafiscality, which in turn are tax rules used as a means of influencing human conduct in the purchase of such products (VEIGA; MELO, 2016). Extrafiscality is negative when incentives, tax exemptions and subsidies in the marketing of pesticides are provided (CAVALCANTE, 2014).

Most pesticides are registered for agricultural use and only a small number of pesticides can be used in Public Health (VEIGA; MELO, 2016). Any use of pesticides in Brazil must comply with current national legislation, regardless of its purpose (VEIGA; MELO, 2016).

The sale of active ingredients in Brazil exceeded 600 thousand tons in 2012. This is due to the public policies of incentives for agricultural poisons, considering the technical products - those obtained directly from raw materials by chemical, physical or biological process destined to the production of formulated or premix products - and Formulated Products (PF) - pesticide or the like obtained from technical or premix product (IBAMA, 2013). Received formulated product reports cover a total of 329 active ingredients. Of this amount, 88 have marketing values disclosed as corresponding to trademarks whose active ingredients have at least three companies holding registration. The 88 active ingredients totaled less than in 2012, corresponding to less than 500,000 tons domestically. However, in 2017, sales of active ingredients corresponded to 539,944.95 tons (IBAMA, 2017).

Some of the bestselling pesticide active ingredients in Brazil are glyphosate and its salts; 2,4-D; Atrazine; Acephate; Chlorpyrifos; Methomyl; Mancozeb; Imidacloprid, among others (IBAMA, 2013). Annual sales, from 2000 and 2012, grew by 194.09%. Herbicides are the most widely applied worldwide, such as glyphosate and 2,4-D, for example, used for weed control, followed by insecticides, fungicides and acaricides. In Espírito Santo, the most commercialized pesticides and related products in 2017 were: glyphosate and its salts; 2,4-D; flutriafol and mancozeb (IBAMA, 2017).

Brazil demonstrates itself as one of the countries with the largest developments in pesticide use in the world. The conditions of a tropical country require producers to use more pesticides; The country runs two harvests a year, which does not happen in cold countries (LIMA, 2016).

*In Table 1, we observe the ten most active ingredients sold in Brazil in 2017, representing 380,965.12 tons of active ingredient commercialized.*

*Source: IBAMA / Consolidation of data provided by the registrants of technical, pesticide and related products, as*

Active Ingredient	Sales (ton. IA)	Ranking
Glyphosate and its salts	173.150,75	1st
2,4-D	57.389,35	2nd
Mancozebe	30.815,09	3rd
Acephate	27.057,66	4th
Mineral Oil	26.777,62	5th
Atrazine	24.730,90	6th
Vegetable Oil	13.479,17	7th
Dichloride de paraquat	11.756,39	8th
Imidacloprid	9.364,57	9th
Copper oxychloride	7.443,62	10th
<b>Total</b>	<b>380.965,12</b>	

*per art. 41 of Decree No. 4,074 / 2002.*

In the state of Espírito Santo, the most sold use class in relation to formulated products is the Herbicide class, with more than 2,500 tons of active ingredient sold. These numbers ranked the state, in 2013, in a position among the ten Brazilian states that have the largest sale in the country of this pesticide class (IBAMA, 2013). The use of these products has been increased due to the need for agricultural production associated with high consumption due to population growth (ANVISA, 2012). In 2017, the state of Espírito Santo totaled more than 3.7 thousand tons of pesticides traded (IBAMA, 2017).

Pesticides are widely applied during food production to control weed and fungal growth or to prevent damage by insects, mites, rodents and others. Often used postharvest to extend plant life and improve quality. The presence of chemicals resulting from the use of pesticides already guide international standards of production, exportation and, consequently, worldwide consumption (KOESUKWIWAT et al., 2010).

The problem of the research is to know if the use of pesticides, commercialized and used, in family farming in the municipality of Santa Maria de Jetibá - ES is high in relation to the state and neighboring municipalities and if these data influence the Gross Domestic Product – GDP of the county in a positive or negative way.

According to a report in GI (2017), Santa Maria de Jetibá has olericulture as one of the strongest activities in

the municipality's trade, being Santa Maria de Jetibá an important marketer and consumer of pesticides. The vegetables grown in the municipality are sold to more than half of the Brazilian states, with 95% of the 5,200 local properties growing vegetables; approximately eight thousand families involved. Due to the high use of pesticides in the daily lives of many farmers, associated with the large commercialization of pesticides in the municipality, it was decided to perform a situational diagnosis of the use of pesticides in the municipality of Santa Maria de Jetibá as well as associate their influence on municipal GDP. Thus, the objective of this work is to make a situational diagnosis of the commercialization and use of pesticides in family farming in the municipality of Santa Maria de Jetibá-ES, through studies on existing public data, presenting the panorama of marketing and use of pesticides in the municipality, analyzing the influence on the GDP of the municipality of Santa Maria de Jetibá through the existing public data.

## II. MATERIALS AND METHODS

In order to achieve the objective of this study, the research adopted was qualitative through the case study strategy. Performed through a triangulation of data from: institutional data, internet data and interviews. Thus, the research uses the following research instruments: exploratory interviews, data analysis and semi-structured interviews by agenda.

### 2.1 Study Area

The data observed are from the city of Santa Maria de Jetibá, mountain region of Espírito Santo, located 80 kilometers from the capital city of Vitória. It is a city with colonization of immigrants, with approximately 39 thousand inhabitants, mostly Pomeranians and Germans who carry the traces of cultural tradition, especially the Pomeranian language. The municipality has as economic foundation the agricultural production, maintained by family farmers in small rural properties (IBGE, 2013).

The municipality has the agricultural activity with the greatest influence on the city's economy, as it has considerable agricultural potential in its economy. (SANTA MARIA DE JETIBÁ, 2015).

### 2.2 Sociodemographic, Economic and Environmental Characterization

Demographic data allowed quantifying population groups to perform calculations and analyzes. These data consist of number of inhabitants, births and deaths, separated and distributed by sex, age, education and occupation (MINISTRY OF HEALTH, 2013). These data were obtained from the free access website of the

Brazilian Institute of Geography and Statistics (IBGE). The city's economy data were obtained by consulting the IBGE through an online survey on the institute's website.

### 2.3 Data Collect

They were acquired through consultation with the Brazilian Institute of Geography (IBGE), Institute for Agricultural and Forestry Defense (IDAF), Brazilian Institute of Environment (IBAMA), and the application of questionnaires to family farmers and doctors.

To promote communication, to establish the speeches and to obtain the complementary data of the research, it was necessary to apply the semi-structured interview, with closed and open questions. The questionnaire was answered by family farmers in the municipality.

#### 2.3.1 Use Of Agrotomics

A case study of a company in the municipality of Santa Maria de Jetibá was prepared, separating only data available from the company by IDAF, from 2015, differentiating the herbicide, insecticide and fungicide classes and their quantities of pesticides sold in liters and in kilograms, to assess the most traded and most-at-risk group for the population as well as their possible health effects. This analysis is corroborated by the interview conducted by family farmers conducted in a master's work, where respondents had the opportunity to report on their experiences in rural life using the pesticide.

#### 2.3.2 Interview

The interview was comprised in a master's work with the application of a semi-structured questionnaire, in face-to-face research methodology, with simple and well-directed questions. However, in this study we used only the extra interview reports, reports about the influence of pesticides on their lives spontaneously from the interviewee. The interviews were conducted in the homes and appropriate places of the interviewees themselves duly authorized by them.

The inclusion criteria for choosing the families and persons interviewed was at least three years of work and farming with the use of pesticides; be a farmer; have no impediment of religious nature or any other belief that precludes participation in the study; be at least 18 years old; voluntarily agree to participate in the study by signing the informed consent form (Annex).

The number of respondents was 56 farmers, according to the criterion of information redundancy, but 39 extra spontaneous reports of the interviewees were used. Redundancy is understood as the moment when information is sufficiently confirmed and the emergence

of new data is increasingly rare (ALVES-MASSAOTTI; GEWANDSZNAJDER, 1998).

Farmers were asked some questions, as well as others such as: (a) Use or not of pesticides; (b) frequency of use; (c) The classes they use (herbicide, insecticide, fungicide, etc. and the most commonly used; (d) Visits by professionals for instruction of use; (e) Frequency of rural technical assistance by INCAPER.

The research project was submitted to Plataforma Brasil, for analysis and approval by the Research Ethics Committee (CEP), Health Sciences Center, Goiabeiras Campus of the Federal University of Espírito Santo, as it involves research with human beings, with the opinion number: 3228832 and status of the Opinion: approved on March 28, 2019. Research project approved in accordance with the CEP Consubstantiated Opinion (Annex 2).

The interviewees were properly informed about the research interests and the study objective and, agreeing to participate, signed an Informed Consent Form, according to the Resolution 466/12 of the National Health Council / Ministry of Health.

## III. RESULTS AND DISCUSSION

### 3.1 Agricultural production

The interviewees were properly informed about the research interests and the study objective and, agreeing to participate, signed an Informed Consent Form, according to the Resolution 466/12 of the National Health Council / Ministry of Health.

It was possible to evidence that the agricultural production of the municipality of Santa Maria de Jetibá includes more than one hundred different types of crops, characterizing the agricultural diversity of the municipality that reaches different agricultural markets. Santa Maria de Jetibá occupies the position of largest producer of fruit and vegetables among the cities of Espírito Santo (PMSMJ, 2016).

The interviewees stated that crops vary with the planting period and because of crop rotation performed in the planting area as a way to prevent disease and increase yield. They also reported that the crop is diverse and that pesticides vary according to the type of crop.

For each type of agricultural crop, there are several active ingredients that can be used as a pest control (ANDREI, 2017). The use is determined by the types of pests that travel the crop (ANDREI, 2017). Thus, knowledge of the classes that are sold in the municipality of Santa Maria de Jetibá made it possible to highlight the main groups commercialized in the municipality, as well



as some products that are not related to crops, but were somehow sold to be used.

Table 2 consolidates the products with their active ingredients, chemical groups and intoxication medium. These pathways were selected considering as the main reported by the interviewees compared to those of the label.

*Table 2 - List of ten pesticides with significant representativeness in retail trade in Santa Maria de Jetibá*

Pesticide	Active principle	Chemical group	Pathways of Intoxication
Gramaxone 200	Paraquat	Bipyridylum	Contact / inhalation
Danimen 300 CE	Fenprothrin 300g/L	Pyrethroid	Contact / inhalation
Score 250	Difenoconazole	Triazol	Contact / inhalation
Furadan 50 ou 350	Carbofuran	Benzofuranyl methylcarbamate	Contact / inhalation
Polytrin 400/40	Cypermethrin 40g/L; Profenofós 400g/L	Organophosphate; Pyrethroid	Contact / inhalation
Decis 25 CE	Deltamethrin	Pyrethroid	Contact / inhalation
Pirate 240 SC	Chlorfenapyr	Pyrazole Analog	Contact / inhalation
Verdadeiro 600 WG	Cyproconazole; Thiamethoxam	Triazole; Neonicotinoid	Contact / inhalation
Amistar Top	Azoxystrobin; Difenoconazole	Strobilurin and Triazol	Contact / inhalation
Roundup	Glyphosate acid; Isopropylamine salt	Substituted Glycine	Contact / inhalation

*Source: Adaptation from IDAF (2019).*

Farmers reported nausea, vomiting, dizziness, skin irritation and others. Ingestion cases are not very common, but were frequent in suicide cases.

Cases of intoxication resulting from the inappropriate use of pesticides have been described, where symptoms of intoxication associated with moderate exposure are subjective and vague, such as headache, malaise, stomach pain, weakness and drowsiness, among others (CASTRO, 2011). The slow intoxication, resulting from the exposure of rural workers to pesticides, deserves attention, as they are the most worrying, as the symptoms are not exclusive to poisoning, and may be confused with other pathologies including parasitic diseases (ROUQUAYROL;

ALMEIDA-FILHO, 2013). Such intoxications are termed acute, but often are limited to just headaches among other annoyances. Official data are limited to hospital reports related to acute poisoning. This picture, accommodated by underreporting, is given as a "silent tragedy" (ROUQUAYROL; ALMEIDA-FILHO, 2013).

Pignati (2017) surveyed 23 active ingredients proving the diversity of specific active ingredients in only four crops in ten municipalities. It is noted that in Santa Maria de Jetibá, the focus is different in relation to crops; however, a much larger variety of crops is planted. Thus, the variety of pesticides present in the municipality is even greater when compared to the work of Pignati (2017), resulting in greater attention in relation to application, requiring from the farmer greater knowledge of the preparation and application, since each pesticide It has its peculiarities and distinct pathways of intoxication.

### 3.2 Agrotoxic Sales In The City Of Santa Maria De Jetibá

The most commercialized pesticide classes in the municipality of Santa Maria de Jetibá were herbicides, fungicides and insecticides (Table 5).

*Table 5 – most commercialized pesticide classes in the municipality of Santa Maria de Jetibá-ES*

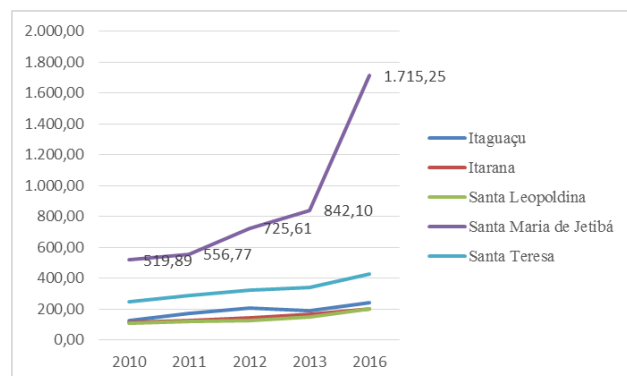
Classes	KG	LT
Fungicides	28.772,88	17.097,67
Insecticides	5.684,63	18.843,22
Herbicides	2.984	41.013,27
TOTAL	34.460,5	76.954,16

*Source: Adaptation from IDAF (2015).*

Data on the quantity of pesticides sold by the Company studied were provided by IDAF, as established by State Law No. 5,760 of December 2, 1998, as amended by Law No. 6,469 of December 11, 2000, which establishes, among other things, that all company that commercialize the pesticide must send this institute a semi-annual report of its sales.

The agricultural activity associated with the commercialization of pesticides in the municipality promotes a significant contribution to the economy of the municipality explained by the Gross Domestic Product (GDP). The analysis of GDP allowed highlighting Santa Maria de Jetibá to the highest level in relation to gross domestic product compared to the neighboring municipalities that make up the highland region of the state of Espírito Santo (Figure 1) and (Table 6).

Figure 1 - Graph of GDP at current prices (R\$ million)



Source: (IBGE, 2016)

The results obtained in the GDP data at current prices; there is a significant difference between the GDPs of the municipalities of the highland region of Espírito Santo, more expressively Santa Maria de Jetibá (IBGE, 2016).

Producing food and proving a strong agriculture, the municipality showed the highest value added of Espírito Santo agriculture, being superior to the related municipalities compared in figures 1 and 6 (IBGE, 2016).

Table 6 - Gross Domestic Product per capita (R\$ 1,00) among municipalities of the highlands of Espírito Santo - 2010 to 2013 and 2016

Microregions and Municipalities	2010	2012	2013	2016
Central Serrana	12,061.67	16,299.99	16,842.77	18,921.16
Itaguaçu	9,158.62	14,692.45	12,667.32	16,575.42
Itarana	10,711.42	13,592.74	14,724.25	18,192.73
Santa Leopoldina	8,819.55	10,605.56	11,760.66	15,562.70
<b>Santa Maria de Jetibá</b>	<b>15,211.26</b>	<b>20,736.56</b>	<b>22,325.00</b>	<b>26,239.09</b>
Santa Teresa	11,502.85	14,761.10	14,482.61	18,035.85

Source: IJSN (2015) e IBGE (2016).

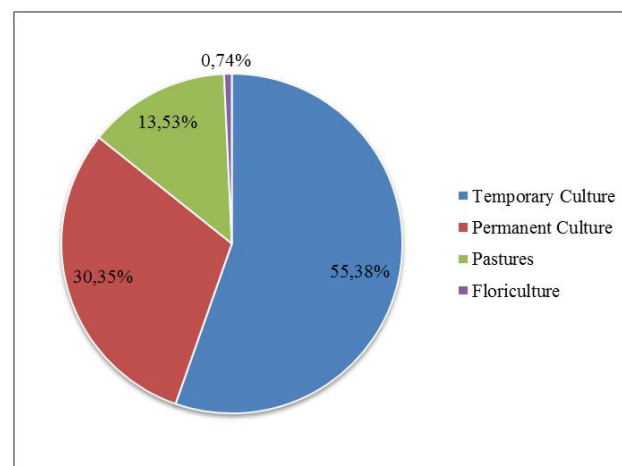
GDP at current prices means all wealth without inflation produced in the locality analyzed and, in table 3, we can see the behavior of federations over the years 2010 to 2013 and 2016 (IBGE, 2016). It was observed that Santa Maria de Jetibá had a growth of 161.98%, above the Central Serrana, with 150.06%, Espírito Santo, with 137.19% and Brazil with 132.69%.

Agricultural activity in line with the sale of chemicals in Santa Maria de Jetibá contributes approximately 46% of GDP at current prices relative to the Central Serrana region, demonstrating its representativeness regarding its economy. Some local conditions, such as climate, humidity, rainfall, the production and supply of local inputs, the improvement of roads and the dedication to work by Santa Marian farmers, Pomeranian descendants, contribute directly to explain the economic power of the municipality.

Allied to these constraints, structural changes in Espírito Santo promoted the vertiginous growth of the population of Greater Vitória, the main consuming center of produce produced by Santa Maria de Jetibá. The municipality is characterized by having a very different agricultural production in relation to the spatial context of Espírito Santo, which is marked by the predominance of permanent crops and destined for the foreign market, especially coffee. Even inserted in this spatial context, Santa Maria de Jetibá follows the opposite path, since horticulture is predominant in the municipality and agricultural production is primarily intended for the domestic market (BERGAMIN, 2015).

Figure 2 shows the percentage of participation of agricultural activities by number of establishments specified in temporary culture, permanent culture, pasture and floriculture. It is possible to evidence that 55.38% of agricultural crops in Santa Maria de Jetibá is associated with temporary or annual crops, 30.25% for perennial crops, 13.53% for pastures and the rest for floriculture (IBGE, 2019).

Figure 2 - Participation of agricultural activities by number of establishments (2017).



Source: IBGE/Censo Agropecuário, (2019).

Most of the crops on small family farms are vegetables, as they have high yields, but they are intensively and systematically performed with permanent use of pesticides (BERGAMIN, 2015). Investment in increased vegetable production favors the diversification of agricultural pillars contributing to the increase in GDP. It is important to diversify production by planting other types of cultivars so that there is GDP growth and that in times of crisis and decline of one crop, another replaces it without falling GDP (DA SILVA, 2016).

Per Capita GDP in Santa Maria de Jetibá is quite representative, since the city is mostly represented by services and agriculture, mainly governed by family agriculture (Table 7), since each family, in a small territorial space, generates a reasonable income, strengthening trade in the municipality and stimulating economic growth.

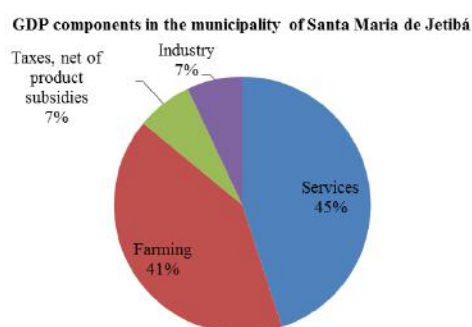
The GDP component values for the municipality are represented by 44.82% for services equivalent to R\$ 377.40, except public administration and public administration and 41.19% for agriculture equivalent to R\$ 346.83 of a total R\$ 842.10 (Table 7) and (Figure 3).

Table 7 - GDP components in the municipality of Santa Maria de Jetibá – 2013

GDP components in the municipality of Santa Maria de Jetibá		
Components	Value (R\$ milhões)	Part. %
Farming	R\$ 346,83	41,19
Industry	R\$ 55,68	6,61
Services	R\$ 377,40	44,82
Services except public administration	R\$ 239,23	28,41
Public administration	R\$ 138,17	16,41
Taxes, net of product subsidies	R\$ 62,19	7,39
<b>GDP at current prices</b>	<b>R\$ 842,10</b>	<b>100,00</b>

Source: IJSN (2015) and IBGE (2016).

Figure 3 - GDP components in the municipality of Santa Maria de Jetibá – 2013



Source: IJSN (2015) and IBGE (2016).

From the results obtained in the data of the components of the GDP (Figure 3 and Table 8), it is verified the commercial importance of the agriculture in the municipality and with this the high use of pesticides, to guarantee the productivity.

Table 8 - Share in % of Espírito Santo GDP at Current Prices - 2010 to 2013

Share in % of Espírito Santo GDP at Current Prices				
Microregions and Municipalities	2010	2011	2012	2013
<b>Central Serrana</b>	<b>1,32</b>	<b>1,20</b>	<b>1,31</b>	<b>1,44</b>
Itaguaçu	0,15	0,16	0,18	0,16
Itarana	0,14	0,12	0,13	0,14
Santa Leopoldina	0,13	0,11	0,11	0,13
<b>Santa Maria de Jetibá</b>	<b>0,61</b>	<b>0,53</b>	<b>0,62</b>	<b>0,72</b>
Santa Teresa	0,29	0,27	0,28	0,29

Source: IJSN (2015) and IBGE (2016).

The values of the participation in percentage of the GDP of Espírito Santo in the city of Santa Maria de Jetibá were 0.61, 0.53, 0.62, and 0.72 for the years 2010, 2011, 2012 and 2013, respectively. The municipalities of Itaguaçu, Itarana and Santa Leopoldina obtained a participation of less than 0.20% for all years (2010 to 2013). Santa Tereza, meanwhile, presented an average of approximately 0.28 percent, as shown in Table 8 and Figure 3.

#### IV. CONCLUSION

The municipality of Santa Maria de Jetibá has agriculture for GDP and this in turn makes the volume of pesticides high in the municipality.

Santa Maria de Jetibá is a municipality with a large agricultural variety clearly showing the influence on pesticide retailing, both in terms of quantity and variety of pesticides, since the use of pesticides may vary in terms of crop. Diversified agricultural cultivation requires a greater number of pesticide types leading to increased local commercial turnover of commercial agricultural retail companies.

The values of the share in percentage of Espírito Santo GDP in the city of Santa Maria de Jetibá were much higher than those of neighboring cities that do not practice intensive agriculture.

The consumption of pesticides in the municipality was increased due to the lack of technical guidance by public sector extensionists, consolidating the assistance to private pesticide resale firms and aiming to increase the productivity of each rural producer.

The amount of poisoning in the city can be large due to the toxicity of these chemicals, and should be analyzed and studied by public and private institutions in attention to human health through actions to be developed by health agencies to control the poisoning of primary, secondary and tertiary levels.

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